Wellfleet Bay Subwatershed
Wellfleet, Cape Cod, Massachusetts

The Wellfleet Bay Subwatershed, totaling approximately 11,936 acres, is located in Wellfleet, Eastham, and Truro. Wellfleet Harbor is 4.98 miles long north to south and varies in width east to west to a maximum of 3.3 miles at mean high water (MHW). The maximum depth at MHW is 43 feet but the mean depth is only 6.2 feet. Since tidal amplitude is 10 feet, much of the harbor is dry at low tide; the area decreases from 6,094 acres at MHW to 3,815 acres at mean low water (MLW), a difference of 37.4%; the bordering marshes total 1,117 acres. The principle creeks and estuaries are the Herring River, Duck Creek (two branches), Blackfish Creek, Fresh Brook, Silver Spring Brook, and Hatches Harbor. The Herring River is the largest freshwater input into the Harbor. The Cape Cod National Seashore and the Massachusetts Audubon Society's Wellfleet Bay Wildlife Sanctuary have preserved much of the surrounding shores from modern clearing and development.

The watershed also includes twenty permanently flooded freshwater "kettle" ponds. Located within the pine-oak forested landscape of the Cape Cod National Seashore, these ponds range in size from over 100 acres to less than two acres. The watershed also provides critical habitat for many rare, threatened, and endangered species. Areas designated by the Natural Heritage Program include Great Island, Duck Harbor, Indian Neck, Old Wharf Point, Lieutenant Island, the center of town, and an area just beyond the library, as well as a large area within the National Seashore that surrounds the kettle pond extending from Duck Pond north to Horseleech Pond in Truro.

The watershed also includes Route 6, the major transportation link for Cape Cod. The backbone for highway travel north-south within the Lower Cape, Route 6 runs between the Orleans rotary and Provincetown. Within Wellfleet, the road extends 7.5 miles from the Eastham to the Truro town line. The Cape Cod Commission 2000 traffic counts indicate that as many as 16,000 car trips per day occur during the summer season.

Wellfleet Bay is the largest near shore embayment on Cape Cod. The size of the harbor and the protection afforded by land surrounding the harbor on three of four sides makes Wellfleet one of the best small boat sailing harbors in New England and an important federal harbor of refuge. Much of the land area around the harbor remains in an unaltered, natural condition due to the presence and protection of the Cape Cod National Seashore. The Massachusetts Audubon Society's 1,000-acre sanctuary also protects a variety of natural habitats and offers an unrivaled environmental education site. Private areas within the boundaries of the Area of Critical Environmental Concern (ACEC), established in 1989, are still relatively undeveloped compared with other waterfront areas of Cape Cod.

The Wellfleet oyster is known around the world for its exquisite taste, which can be attributed to the unique water quality and favorable growing conditions in the harbor. The wide variety of rare species inhabiting the Wellfleet Harbor area attests to the diversity and environmental integrity of wildlife habitats.

The various tributaries contribute abundant freshwater to the Harbor, reducing the salinity and creating favorable oyster growing conditions. The broad salt marshes provide a constant supply of the organic nutrients that form the basis of the marine food chain. The result has been the prodigious productivity of Wellfleet Harbor. Beginning in the seventeenth century, Wellfleet was renowned for the abundance and quality of its shellfish. More recently, the success of Wellfleet shellfishermen in growing quahogs from seed in propagation boxes has demonstrated clearly that the special environment of the Wellfleet flats produces the fastest rate of quahog growth on the Cape. In the below average harvest year of 2001, the wholesale value of the shellfish industry in Wellfleet was estimated at least $2.6 million. Over half of the shellfish grants in the entire Commonwealth are in Wellfleet.

The greatest threat to all water resources and wildlife habitat, and thus to the watershed, is the

continuing growth of development and overuse of the natural resources. Wellfleet has been struggling with elevated nitrate levels in groundwater for over 30 years. Tests have indicated that almost half the parcels in the Central Distract have levels above 5 parts per million (ppm), the limit recommended in the Cape Cod Commission's Regional Policy Plan and in the town's Local Comprehensive Plan. Fourteen percent of the parcels in the Central District showed levels above the federal limit of 10 ppm.

The kettle ponds of the Cape Cod National Seashore are a unique and fragile resource with ecological, aesthetic and recreational value. These ponds range in trophic condition from oligotrophic (clear and nutrient poor) to eutrophic (naturally and culturally enriched with nutrients and organic matter). The ponds are heavily used for fishing. Gull, Long, and Great Ponds are also heavily used for swimming. Homes with on-site septic systems border the most of the ponds. These ponds are sensitive to changes in acid balance and nutrient inputs because of their low acid-neutralizing capacity and phosphorus concentrations.

In the past few years, the National Park Service has conducted and coordinated research programs on the kettle pond to investigate the status of pond water quality. These and other studies indicated there are five major areas of concern for pond water quality: 1) excess nutrient additions resulting in cultural eutrophication (human induced addition of nutrients in excess of their natural quantity and rate of availability); 2) sediment addition from shoreline erosion; 3) possible public health hazards from bacterial contamination; 4) possible chemical pollution; and 5) potential acid rain impacts.

Wellfleet Harbor is a rich and productive estuarine area. In recognition of its unique and delicate environmental assets, the harbor was designated an Area of Critical Environmental Concern (ACEC) in 1989. Wellfleet Harbor has historically been pristine and supported many water dependent uses. The future of Wellfleet's seaside character and economic base is dependent upon the maintenance of water quality. Therefore, one of the most important issues that will shape plans for the future is marine water quality. There are three fundamental water quality problems that must be considered: 1) bacteria and pathogen contamination; 2) nitrogen loading; and 3) toxic chemical contamination. The presence of bacterial contamination and nitrogen loading has been well documented, and there is an ongoing threat of toxic chemical contamination from boat paints, gasoline, oil, and pesticides.

Wellfleet Harbor has recently experienced eelgrass loss and increasing frequency of nuisance algal blooms. This has lead to concern that portions of the Harbor are receiving excess nitrogen. Recent data on measurements of oxygen depletion found in the Duck Creek and Herring River zones indicate that several subembayments in the Inner Harbor may have reached their assimilative capacity for the nutrient.

A portion of the Herring River system in Wellfleet is tidally restricted and contributes high acidity and aluminum non-point source pollution to the river. Acidity is severe (pH 3.5) and aluminum is at toxic concentrations in low flow ditches and creeks in the system. As a result, fish and other aquatic fauna are in extremely poor conditions. The cause of the problem is tide restriction and ditch drainage since 1909 that has drained and aerated the original salt marsh peat, causing stored sulfidic minerals to oxidize to sulfuric acid.

To ensure its survival and to protect its resources, Wellfleet has undertaken a number of measures to restore, preserve, and protect its fresh and marine water resources. In July 2001, the town signed an administrative consent order with the Department of Environmental Protection (DEP) that requires the town to have a municipal water system in place to serve municipal buildings by September 2003. It is important to note that the impetus behind this agreement was not poor water quality, but rather the lack of an adequate zone of contribution for a public supply for the municipal buildings. In October 2001, the residents voted to approve a $1.4 million system that could service the library, Department of Public Works building, Town Hall, Police and Fire departments, Elementary School, Baker Field recreation area, current Senior Center, and the Marina.

Wellfleet currently has one small municipal water system that serves thirty households in an area around the transfer station on Coles Neck Road. The rest of the town is serviced by individual private wells and on-site septic disposal systems. It is estimated that close to half of all lots in the downtown area of Wellfleet could not fit a Title 5 septic system on the property. The Eastham and Truro portions of the watershed also have no public water supply or sewer systems.

Several long-term planning efforts are underway. The town's Harbor Management Plan and Local Comprehensive Plan will both be updated over the next two years. The revised Harbor Management Plan will be a more comprehensive study that includes an in depth examination of the interrelationship of the harbor, the marina and shell fishing. The town is also participating in the USGS groundwater modeling study and was selected by the Cape Cod Commission as one of the first towns to undertake a long-term infrastructure and facilities plan. The town has also acquired professional staff in its planning, shellfish, and conservation departments.

Stewards:

- Friends of the Cape Cod National Seashore
- Natural Resources Advisory Board
- Wellfleet Conservation Commission
- Wellfleet Conservation Trust
- Wellfleet Audubon Sanctuary

Studies conducted in the watershed:

- Wellfleet Harbor Project. Water quality monitoring from June 1992 to November 1996.
- Water Resources of Outer Cape Cod. 1998. Cape Cod Commission and Lower Cape Cod Water Management Task Force.
- 20 Frequently Asked Questions about Wellfleet's Herring River. July 2000. Brittina Argow, Coastal Sedimentologist at Westchester Community College, Valhalia, NY.
- Herring River Survey, August 15-17, 1983. Massachusetts Department of Environmental Quality Engineering, Division of Water Pollution Control. Westborough, MA. 1984.
- Impacts from mosquito control-induced sulphur mobilization in a Cape Cod Estuary. Soukup, M.A. and J.W. Portnoy. 1986. Environmental Conservation 13(1):47-50.
- Wetlands assessment work on the Herring River System, conducted by John Portnoy (CCNS) and Charlie Roman (University of Rhode Island).
- Wellfleet's Herring River: The Case for Habitat Restoration. 1997. J. Portnoy and M. Reynolds. Environment Cape Cod 1:35-43.
- Effects of historic tidal restrictions on salt marsh sediment chemistry. 1997. J.W. Portnoy, and A.E. Giblin, Biogeochemistry 36:275-303.
- Development of the Gull Pond Chain of Lakes and the Herring River Basin. Jan. 1994. M.G. Winkler, CACO.
- Watershed Analysis and Nitrogen Loading Study of Wellfleet Harbor. Cambareri and Eichner, Cape Cod Commission. 1997.
- Salt marsh diking and restoration: Biogeochemical implications of altered wetland hydrology. 1999. J.W. Portnoy. Environmental Management 24:111-120.
- The Town of Wellfleet received a Coastal Remediation Program grant to do a water quality assessment involving water quality monitoring and design possibilities for stormwater remediation.
- Design and estimated cost of a public water supply system for downtown Wellfleet. Report issued by consulting firm Camp Dresser & McKee, 2000.
- Study of wastewater solutions for the central district of Wellfleet to reduce the flow of nitrates and other contaminants from septic systems into the groundwater and the removal of contaminants from drinking water. Consultants Woodard & Curran. 2001.

- Water Resources Management Plan, Cape Cod National Seashore. September 1999. P. Godfrey, K. Galluzzo, N. Price, Massachusetts Water Resources Research Center, UMass-Amherst and J. Portnoy, Cape Cod National Seashore.
- Synthesis Update (to synthesize and interpret all existing data for Wellfleet Harbor). Conducted by Stearns and Wheler, LLC. 2000.
- Surveys and monitoring of the Cape Cod National Seashore's 20 kettle ponds have been ongoing since the 1970's. Mid-1970's – pond chemistry and trophic status. 1982 – first reliable pond pH data. Since 1986 – systematic pond profiling during summer by Park staff. 1992 – National Park Service developed a monitoring program to study the effects of phosphorus on 20 kettle ponds.
- Kettle Pond Data Atlas for Cape Cod National Seashore: Paleoecology and Modern Water Quality. April 2001. J.W. Portnoy, M.G. Winkler, P.R. Sanford, and C.N. Farris.
- Acid Rain Monitoring Project by the University of Massachusetts-Amherst, 2001. Ryder, Round, Herring, Higgins, and Long Ponds were among the water bodies sampled.
- Division of Marine Fisheries Shellfish Sanitary Survey. Data available on fecal coliform bacteria counts from 1987 to present.
- Hydrologic Analysis of the Water Resources of Lower Cape Cod. US Geological Survey. Conducted during 2001-2003.
- Cape Cod Atlas of Tidally Restricted Salt Marshes. 2001. Cape Cod Commission.
- Source Water Assessment Program (SWAP) in Eastham, conducted by Department of Environmental Protection. Final Reports available for four of the five nontransient noncommunity (NTNC) public water supply systems (such as schools) in 2002. Of 45 transient noncommunity (TNC) water suppliers (such as restaurants) in the town, 24 were assessed by 2002 with final reports available for 17 of them.
- Wellfleet Harbor was selected as a priority area for Year 2 of the Massachusetts Estuaries Project, funded by the state and UMass Dartmouth. The goal of the project is to develop critical nutrient loading thresholds for each embayment to aid in water resources planning. The thresholds will support federal requirements for the development of Total Maximum Daily Loads for impaired surface waters. This area was evaluated in 2003.

Who is collecting water quality data and where:

- Joint project between the Cape Cod National Seashore and the Wellfleet Shellfish Department to monitor water quality (including physical parameters, nitrates, phosphates, cholorophyll) monthly at 10 stations in the Harbor through 2002.
- Monitoring of freshwater ponds by the Cape Cod National Seashore.
- Wellfleet Audubon Wildlife Sanctuary coordinated a volunteer monitoring program in Summer 2001.

Management actions taken:

- Wellfleet Harbor was designated a No Discharge Area by the state. The discharge of all boat wastewater, even if it has been treated, is prohibited.
- In the Fall of 1999, the Town of Wellfleet was awarded a Coastal Pollutant Remediation (CPR) grant from Massachusetts Coastal Zone Management (CZM) to assess stormwater mitigation at Duck Creek and Town Pier. Project identified stormwater discharge points, quantified flows, and identified and evaluated potential solutions for mitigation of stormwater contaminants.
- Commercial Street Upper Elevation Stormwater Remediation Project. Funded through FY02 CPR. Project installed two infiltration facilities to capture and infiltrate stormwater from Commercial and

Bank Streets, reducing stormwater discharges into Duck Creek and protecting its shellfish resources.
- The Town of Wellfleet, with assistance from EOEA Self Help funds, acquired land in the Fox Island Marsh Conservation Area.
- Massachusetts Division of Fisheries and Wildlife stocks Gull Pond with rainbow, brook, and brown trout.

Subwatershed facts: (See Appendix for data sources)

- 21 E sites: 2 - Mobil Station, Route 6; Wellfleet Texaco, Rte. 6
- Solid waste sites: 1
- Zone IIs located in this watershed: none
- Interim Wellhead Protection Areas (IWPAs): approximately 38
- Percent of the undeveloped land that is protected (according to 1985/1990 data): 73.2%
- Acres of existing wetlands: 1,837
- Certified vernal pools: 1
- Named freshwater ponds: Herring, Higgins, Gull, Long, Dyer, Perch, Squires, Hawe's *(Wellfleet)*, Great, Round, Snow, Ryder, Slough *(Truro)*, Sunken Meadow *(Eastham)*
- Named rivers or creeks: Herring River, Mill Creek, Fresh Brook, Trout Brook, Silver Spring Brook *(Wellfleet)*, Bound Brook *(Wellfleet/Truro)*, Hatches Creek *(Wellfleet/Eastham)*
- 1998 Massachusetts 303(d) List of Impaired Waters: A segment of the Herring River, from Griffin Island to Wellfleet Harbor – pathogens. Wellfleet Harbor – pathogens.
- Outstanding Resource Waters: Waters in and adjacent* to the Cape Cod National Seashore (*area within 1,000 feet seaward of mean low water).
- Shellfish growing areas: Almost all of Wellfleet's waters are fully approved. Hatches Creek and the upper portion of Herring River are prohibited, while Duck Creek and the lower portion of Herring River are conditionally approved. The closure of Duck Creek is from May 1 to October 1.
- Beach closures: The beaches at Sunken Meadow and Indian Neck were each closed to swimming for at least one day during the 2001 season due to high enterococcus bacteria counts.
- This watershed contains Natural Heritage and Endangered Species Program (NHESP) Estimated Habitats of Rare Wildlife.

Priorities:

- Continue joint water quality monitoring project between the CCNS and Wellfleet Shellfish Department beyond 2002.
- Continue water quality monitoring by the Wellfleet Audubon Wildlife Sanctuary.
- Maintain a healthy commercial shellfish industry as well as the availability of shellfish for recreation.
- Eliminate non-point source pollution from the Town of Wellfleet Marina parking area.
- Renovate the revetment at the town marina.
- Commercial boatyards should all develop containment areas for vessel maintenance.
- Development of a certified Harbor Management Plan that encompasses all issues relating to the harbor's protection.
- Implement Best Management Practices for storm drain on Route 6 that discharges to Hatches Creek.

- Consider the impacts of tidal restrictions on the salt marsh in the Herring River system. The Cape Cod National Seashore has done extensive scientific work that demonstrates the benefits of opening the dike at the mouth of the Herring River. The project now requires a town decision on how to proceed. Army Corps of Engineers estimates cost of restoration of degraded wetlands and of riverine migratory corridors to be $244,000.
- Implement those salt marsh restoration projects identified in the 2001 *Cape Cod Atlas of Tidally Restricted Salt Marshes* that have been evaluated and prioritized by the town. Sites are: Earthen dike restriction of channel off Hatches Creek (Site EA-9), Route 6 restriction of Fresh Brook (WE-1), Route 6 restriction of unnamed channel south of Blackfish Creek (WE-2), Route 6 restriction of Blackfish Creek (WE-3), earthen dike restriction of channel within the Indian Neck Marshes (WE-4), Commercial Street restriction of Mayo Creek (WE-5), and Chequessett Neck Road restriction of the Herring River (WE-6).
- Investigate pH changes in Ryder Pond. The kettle pond has shown a dramatic decline in pH since 1986 and the cause of the decline is unknown (Water Resources Management Plan of the Cape Cod National Seashore, 1999).
- Continue Kettle Pond Assessment. Research topics include: hydrogeologic characterizations, phosphorus budgets, post-glacial development, changing diatom assemblages, phytoplankton monitoring, macrophyte monitoring, Duck Pond zooplankton, Ryder Pond research, and Herring effects on the trophic dynamics of the Gull Pond chain.
- Wellfleet Center and the Route 6 corridor and landfill area in Eastham should be considered for public water supply systems (Lower Cape Water Management Task Force's Final Report, 1998).
- Establish private well monitoring programs to track private well water quality (from the Lower Cape Water Management Task Force's Final Report 1998).
- Evaluate impacts of septic systems on surface and groundwater. Examine ability to inspect all septic systems for compliance.
- The town and National Seashore should begin to explore institutional mechanisms for cooperatively managing the shared water resources of the Outer Cape (Lower Cape Water Management Task Force's Final Report 1998).
- Remove purple loosestrife and other invasives around Higgins Pond.
- Include in Wellfleet's Harbor Management Plan planning for shoreline development, providing criteria for ZBA applications, which would describe "Detriment to the Neighborhood" as increase in volume of structure likely to contribute impact of adjacent marine resources.
- Use the USGS Groundwater Modeling Study to identify and acquire land for future water supply sites.
- Explore potential well sites in North Eastham.

Recreation:

Camping areas:

- Maurice's Campground, Paine's Campground

Golf courses:

- Chequessett Yacht & Country Club Pathways and trails:

Pathways and trails:

- Cape Cod Rail Trail, Great Island Trail, Atlantic White Cedar Swamp Trail, several trails within the Wellfleet Bay Wildlife Sanctuary
- www.capecodcommission.org/pathways/trailguide.htm

Public access:

- www.state.ma.us/dfwele/pab/pabSEmap.htm

Public beaches and landings:

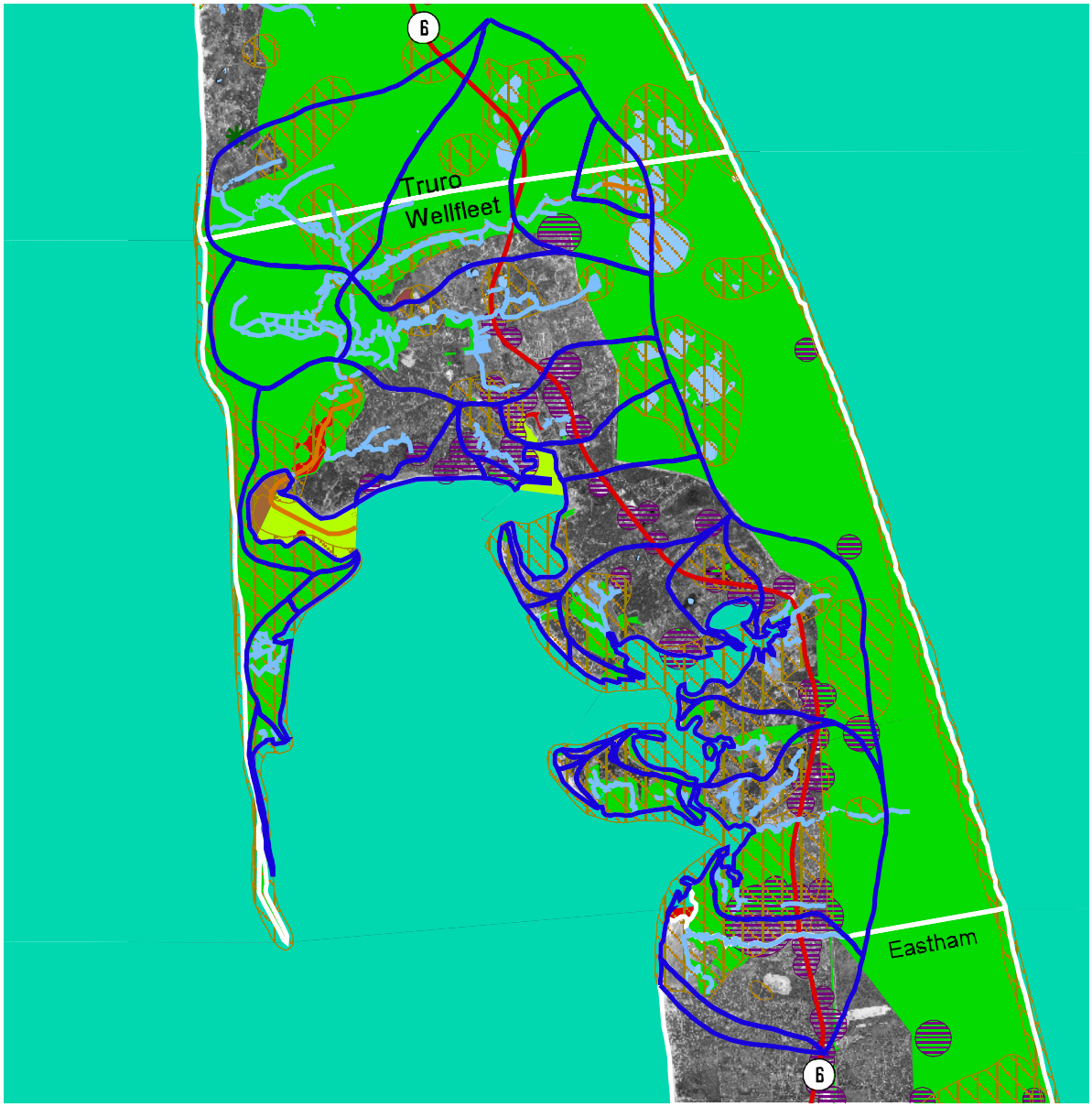
- Sunken Meadow Beach, M. Burton Baker Beach (Indian Neck Beach), Mayo Beach, Duck Harbor Beach, Ryder Beach, Long Pond Pond, Beach, Gull Pond
- Landings at Sunken Meadow Beach, Blackfish Creek, Ryder Beach, Long Pond, Gull Pond

Shellfishing:

- Approved in almost all areas of Wellfleet Harbor

Wellfleet Bay

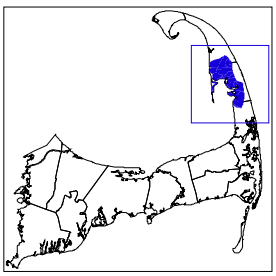
Wellfleet, Eastham, and Truro, MA



Watershed Resources

N

0 1 2 Miles



Natural Heritage and Endangered Species Program Data
- Certified Vernal Pool
- Priority Habitats of Rare Species
- Estimated Habitats of Rare Species

Groundwater Protection Areas
- Interim Wellhead Protection Area
- Zone II
- Solid Waste Facility

Watershed Boundary

Anadromous Fish Run

Shellfish Growing Areas
- APPROVED
- CONDITIONALLY APPROVED
- MANAGEMENT CLOSURE
- PROHIBITED
- RESTRICTED

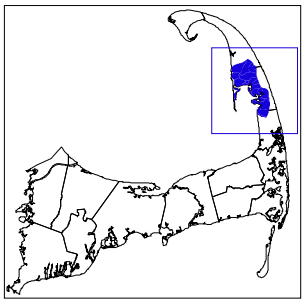
Open Space

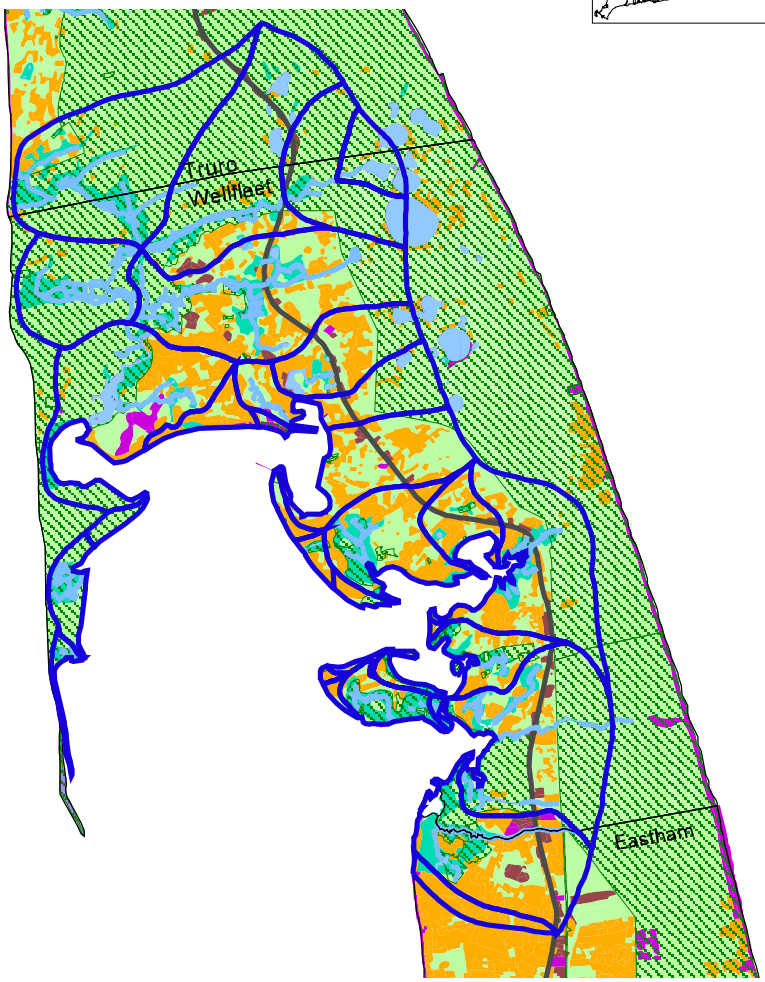
Streams
Ponds
Roads

Prepared by: Courtney Armentrout, EOEA Cape Cod Watershed Team
Winter 2003

Wellfleet Bay

Wellfleet, Eastham, and Truro, MA





Land Use

N

0 1 2 Miles

Land Use

- non-residential developed
- open land
- recreation
- residential
- water
- wetland
- Streams
- Ponds
- Watershed Boundary
- Protected Open Space

Prepared by: Courtney Armentrout, EOEA Cape Cod Watershed Team
Winter 2003